

**Specific heat and magnetization studies of  $Fe_2OBO_3$ ,  $Mn_2OBO_3$  and  $MgScOBO_3$ . \***

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The transition metals in the oxy-borates  $Fe_2OBO_3$  and  $Mn_2OBO_3$  have two different crystallographic sites and mixed valence which allows for different charge ordering configurations. In this work we present susceptibility, magnetization and specific heat measurements and relate them to each configuration. In order to separate the lattice from the electronic contributions to the specific heat, we measured the specific heat of the nearly iso-structural, non-magnetic oxy-borate  $MgScOBO_3$ . From these measurements we conclude that  $Fe_2OBO_3$  presents short-range ferromagnetic order in the paramagnetic state. This order is due to double exchange interactions between ferric and ferrous ions. In the antiferromagnetic state, below 155 K, the double exchange is responsible for the presence of the reentrant weak ferromagnetism found down to approximately 40 K. The oxy-borate  $Mn_2OBO_3$  presents normal paramagnetism and a transition to an antiferromagnetic state at 104 K. We have also observed weak ferromagnetism below 75 K down to the lowest temperatures (2K) which is probably due to single ion anisotropy.

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\*This work was supported by the Brazilian agencies: CNPq, CAPES and FAPERJ